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NETWORKS AND RELATED INITIATIVES FOR INCREASING FLOW OF INFORMATION ON RESEARCH AND DEVELOPMENT RESULTS AMONG RESEARCH AND DEVELOPMENT INSTITUTIONS AND BETWEEN THEM AND SMALL AND MEDIUM SCALE INDUSTRIES IN DEVELOPING COUNTRIES OF ESCAP REGION *

by

C.V.S. Ratnam **

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** Expert on Industrial and Technological Information Network System, Bangalore, India.

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1. A Concept of Network
2. Directories Available

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Introduction

During the last more than three decades, developing countries in ESCAP region have been implementing plans and programmes for raising living standards of their people and for strengthening national self-reliance. One of the modes by which these objectives are sought to be achieved is by industrialization. Industrialization needs technology either from within the country or from outside. As it was difficult to obtain all needed technologies from outside the country and there was a need to utilize to the fullest extent, natural and other local resources for achievement of national objectives, many developing countries of ESCAP region have established R&D* institutions. The R&D institutions were expected to tackle problems of national interest and develop processes and products for establishing industries using local endowments. While most countries have started their modern industrialization process largely with imported technologies, the countries never lost sight of the fact that endogenous development of R&D bases, technologies and technologically competent manpower was most important for promoting national development. With this in view, many R&D institutions were established. Most developing countries of ESCAP region have some R&D infrastructure. The system is briefly described in Table 1**

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* Research and Development

** All tables are at the end of the paper.

Introduction - continued

A study of the work being done in R&D institutions in developing countries of ESCAP region indicates that many of these institutions have similar structures and are engaged in more or less similar type of work. This is a result of the fact that many of these countries have similar agro-climatic conditions and flora and fauna. While there are certain differences with regard to environment and mineral resources, when all the countries are considered, many countries in the region have similarities in this regard also. For example, China and India, two of the largest countries in the ESCAP region and in the world, have many things in common including large populations, varied agro-climatic conditions, a variety of natural resources, minerals, etc. These countries are bound to have common areas of interest in R&D. Therefore, an exchange of information among the R&D institutions existing in countries of ESCAP region can achieve the following:

- reduce time for investigations,
- reduce cost of such investigations, and
- stimulate quicker flow of R&D results to users

Programmes for stimulating exchange of information on R&D results and technologies among developing countries in the world are being implemented by many UN organizations. UNIDO has been prominent in the field. TCDC and ICDC were launched within the UN system specifically for this purpose.

Introduction - continued

Under the auspices of UN organizations several networks of R&D institutions have been established to promote such activities.

UNIDO has been encouraging such activity. They have sponsored networks in small hydro-power development, low cost building materials, medicinal and aromatic plants, leather, etc.

The ESCAP Regional Centre for Technology Transfer promoted the establishment of networks among R&D institutions in developing countries of ESCAP region. Some of them are:

1. Rice Husk Ash Cement
2. Electronics
3. Direct Reduction of Iron Ores
4. Mini and Micro Hydro-Electric Stations
5. Medicinal and Aromatic Plants
6. Domestic Energy Utilization
7. Metal Industries Development Centres
8. Machine Tools

UNESCO has promoted establishment of some networks. One such is SCAMAP for bringing together experts and institutions in South and Central Asia interested in the medicinal and aromatic plants.

Introduction - continued

There are many government and non-government organizations implementing such programmes. For example, ASEAN countries have organized joint R&D activities. They are implementing a number of R&D programmes of common interest. TECHNONET is also one such.

While these networks exist and efforts are being made to bring together R&D institutions in developing countries of the ESCAP region, there is no doubt that these activities need to be strengthened so that they could yield more tangible results than what has been the experienced so far.

R&D institutions and countries are very much benefited by joining these networks. Among the benefits are:

1. Reduction in time for completing projects.
2. Weeding out unnecessary projects.
3. Reduction in cost for carrying out projects.
4. Access to R&D information available inside and outside the country.
5. Promotion of TCDC and ICDC.
6. Efficient use of existing facilities.
7. Promotion of training activities and skill development.
8. Strengthening linkages among R&D institutions and countries.
9. Promotion of self-reliance in developing countries.

A concept of such a network is at Annexure 1. More benefits will accrue if the working of the networks is improved.

R&D Institutions

R&D institutions established in developing countries in the ESCAP region have been tackling many problems which are existing in their respective countries. However, it has not been possible until now, except in some cases, for R&D institutions to contribute substantially in this respect. Medium and small scale industries have tended to look elsewhere for getting their requirements for technologies. It is therefore necessary to know what are the types of services that are required by the industry from the R&D institutions. On this matter R&D institutions need to be provided with information. The items on which R&D institutions require information are listed in Table 2.

R&D institutions can be brought into networks as discussed earlier. The nature of such network has to be deliberated in full and networks established learning from earlier experience of such networks. Such an approach would make the networks more productive. For purpose of increasing flow of information on R&D results, the network has to have the following components:

1. The R&D institutions.
2. The Central Organizations existing in some countries to promote R&D activity.

R&D Institutions - continued

3. UN organization like UNIDO.

Figure 1 gives an arrangement for the network for R&D institutions. The network shows that the R&D institutions, the central administering institutions, and the UN organization are connected together for exchanging information. The methodologies for working such networks have to be carefully worked out.

This network has to be connected to the user network suggested later in this paper.

Earlier experience of the working of such networks has shown that more than verbal commitment at workshops/seminars and international gatherings is needed to make the networks effective. One of the important basic requirements is the approval of the governments involved for allowing the R&D institutions to join networks. Once such an approval is available, R&D institutions could contribute much more to network activity than otherwise. Also, the institutions can get needed financial support from the government. In some cases network activity could also be given priority among the activities of the R&D institutions. In some countries there are central organizations which control activities of individual R&D institutions. For example, in China there is the State Committee on Science and Technology, in India there is CSIR, and in Pakistan there is the PCSIR. The individual R&D institutions will require approval of such central organizations also. In countries where

R&D Institutions - continued

there are a large number of R&D institutions, it may be necessary to link to the network central organizations which would act as focal points within the country for collecting and storage of information and making it available to the network members. In some countries there are organizations for collecting and disseminating R&D information. Their inclusion in the network will be of great advantage to all members in the network. The R&D institutions themselves, when once approvals are available from their governments and central institutions, could do more than what is being done now to strengthen network activity.

For promoting increased flow of information on R&D results to other R&D institutions and to the small and medium scale industry some specific initiatives are needed at the country level, R&D institution level, and the UNIDO level where INTIB has to play an important role. The initiatives that have to be taken at the national level are given in Table 3. The initiatives that need to be taken at the level of R&D institutions are listed in Table 4.

Small and Medium Scale Industries

While many developing countries of ESCAP region had, in the past, a thriving local industry in the tiny cottage and small scale sectors manufacturing all items needed for human life, for example, food, clothing, tools, building materials, medicines, etc., modern industry has come slowly to these countries. In these countries, currently, a large amount of industrial activity is concentrated in the small and medium scale industry. For example,

Small and Medium Scale Industries - continued

In India about 50 per cent of the industrial product is from the small scale sector. There are about one million small scale industrial units in the country. Even in the export sector, small scale industry contributes about 25 percent of the total volume. Such a situation exists in Bangladesh, China, Indonesia, Malaysia, Nepal, Pakistan, the Phillippines, Sri Lanka, Thailand, and other developing countries in the ESCAP region. Small and medium scale industries need technology not only for establishing their production facilities but also for modernization to cope with developments in their respective fields of operations.

For this purpose, these countries need a continuous flow of inputs from outside (Table 5). Linkages among the industrial units is a useful mechanism, some exist now. The most important linkages among small and medium scale industries are industry associations and chambers of commerce. Each type of industry has a separate association. Most members of such associations are also members of chambers of commerce in these countries. Some chambers of commerce and industry association have joined together to form worldwide networks. Industrial units derive many benefits by being members of such organizations. The chambers of commerce and industry associations cater to the common needs of industrial units-legal matters, tax laws, tariffs, labor legislations, technology, etc. They provide forums for exchanging experience on problems faced by them and provide plausible solutions to those problems. The industry has linkages with design and consultancy organizations, technology transfer institutions, promotional agencies, and development banks.

Small and Medium Scale Industries - continued

Industries need some inputs from R&D institutions. These are by way of services for technology assessment, choice and acquisition of technologies, facilities for training of personnel, advice on substitution of imported raw materials, components and equipment, carrying out work on testing, quality control and standardization, providing documentation services, implementation of R&D projects, etc. Therefore, the linkage between R&D institutions and small and medium scale industry becomes important. Initiatives that need to be taken by industry are listed in Table 6.

Linkages between R&D Institutions and Small and Medium Scale Industry

With relatively large investment in endogenous R&D efforts and on infrastructure of small and medium scale industry, and the need for developing self-reliance in developing countries of the region, there is an urgent need to forge strong linkages between R&D institutions and industry. This linkage will facilitate R&D institutions to know better what is required by industries so that the institutions could orient their programmes towards meeting the needs of the industry. On the other hand, small and medium scale industry can also know what is available from R&D institutions, their strengths and weaknesses, and how weaknesses could be got over.

Linkages between R&D Institutions and Small and Medium Scale Industry - cont.

Increasingly, it is becoming evident that technologies from the more developed countries are becoming more and more expensive. Time and again, it is found that when technologies are available from developing countries they are cheaper as compared to those from developed countries. Also, in view of similarity of resources, markets and environments, technologies from a developing country are likely to be more relevant in other developing countries. It is also a fact that R&D effort in developed countries is not per se interested in tackling special problems encountered in developing countries due to their special environments and endowments. No R&D institutions can be expected to tackle problems which are not of immediate importance in their environment. Under these circumstances, the R&D institutions in developing countries will have to engage themselves in solving R&D problems of interest in their own countries and make available results of such R&D to small and medium scale industries and others. Such technologies are more likely to be based on the premise of maximizing use of resources available within the countries. Under such circumstances, it is clear that strong linkages will have to be established between R&D institutions and industry. Also because of similarities of interest there is need for bringing together small and medium scale industries existing in different developing countries of the region into networks.

Linkages between R&D Institutions and Small and Medium Scale Industry - cont.

There is need to develop linkages between networks of R&D institution and industry. Link organizations like design, engineering, and consultancy companies, technology transfer organizations, and promotional agencies have to find a place in such a system.

Networks among Small and Medium Scale Industrial Units

As mentioned earlier, the most important linkages among the small and medium scale industries are industry associations and chambers of commerce. It was also mentioned earlier that the small and medium scale industrial units need to be linked to R&D institutions. There is need to establish linkages between industry and design, engineering, and consultancy companies, technology transfer organizations, promotional agencies, and development banks. In view of the fact that the number of small and medium scale industries is relatively large, it will be difficult to connect in a network individual industrial units and individual R&D institutions. In this case the industry associations and chambers of commerce have to play the central role. The have to be connected to the R&D network. Also, association of design and consultancy organizations, technology transfer organizations, and promotional agencies have to be involved.

A plan for connecting small and medium scale industries to the R&D network is given in Figure 2.

UNIDO Industrial and Technological Information Bank (INTIB)

In 1977, INTIB was established in UNIDO to assist developing countries by providing information on industries, technologies, etc. In both the networks, namely, network of R&D institutions and network of small and medium scale industries, INTIB has to play an important role for promoting increased flow of information. Figures 1 and 2 give the role of INTIB in the networks. The initiatives that have to be taken in the INTIB for being part of these networks and for promoting increased flow of information among the network members are given in Table 7.

Modern Development in Information Gathering and Dissemination

One of the current important developments in the area of information collection, storage, retrieval, and dissemination is the availability of computers and services of data bases. In most developed countries these instruments are being used increasingly for facilitating quick collection of R&D data, its storage, retrieval, and dissemination. Computers are becoming cheaper everyday. They are also having large capacities which were unthinkable some years ago. Developing countries have to give consideration to the use of such modern devices in their information activities. One can say without hesitation that without the use of such devices, developing countries will continue to be underdeveloped. Therefore, it is important that these modern instruments are utilized for promotion of increased flow of R&D institutes and from them to industry.

Modern Development in Information Gathering and Dissemination - continued

Thus, when one considers the modalities for increasing the flow of R&D results to small and medium scale industries in the ESCAP developing countries, one has to take into consideration the existence of the following agencies and instruments available to these countries.

(1) R&D institutions;

(2) Central R&D organizations;

(3) Chambers of commerce ad industries associations whose members are individual small and medium scale industries;

(4) UNIDO/INTIB; and

(5) Modern facilities like computers and data bases.

(6) Link organizations and promotional agencies.

Taking the above facts into consideration, the modality for increasing information flow of R&?D results is suggested below. The modalities again have to mainly be worked out inside the country and outside, the INTIB level. These are:

Modern Development In Information Gathering and Dissemination - continued

A. Inside the Country

1. Approval of governments for identified R&D institutions to join the network;
2. Identification of R&D institutions;
3. INTIB entering into an agreement with governments and working out details of information flow with R&D institutions;
4. Establishing a collection, storage and dissemination system in the country, R&D institutions itself, if there is only one such institution or so or a central organization if a large number of R&D institutions are involved in a country.
5. Where a large number is involved, a central computerized information system has to be organized;
6. When only one or two are involved, manual arrangements may do, if no computer system is available;
7. Organization of staff for doing the work involving collection, storage, and dissemination of information to INTIB and members of network; and
8. Working out inputs of INTIB and national governments and R+D institutions.

Suggested Parameters for Network Activities

The principle is decentralized collection, centralized processing, and decentralized dissemination. The implications of this principle are as follows:

1. Countries to bear most costs of establishing centres for information collection, storage, and dissemination in the country.
2. Providing assistance to countries, as needed, in developing a system of collection, storage, and dissemination - computerized or manual.
3. Providing to country institutions external financial assistance to meet a part of the cost of the system.
4. Establish in INTIB, a data base of R&D results having potential for use in industry - eventually to be on-line.
5. Arranging to send every month to network members, a letter containing R&D results with industry potential.
6. Establish a news service - to feed selected technical publications with monthly information.
7. Organize monitoring activity for the network.

Other Activities:

1. Lectures/Seminars - to bring developments to the attention of R&D institutes and chambers of commerce and industry associations.
2. Periodical workshops of network members - once in two years.

Suggested Parameters for Network Activities - continued

Other Activities: - continued

3. Visits to R&D institutions by leaders in other centres.
4. Get-togethers - essentially inside the country between R&D institutions and potential users of R&D results.
5. Organization of training programmes.

Note: 1. INTIB to meet all its in-house expenditures; including establishment of data base and all services.
2. INTIB to meet agreed costs in the countries.

Taking the above parameters into consideration and assuming that in the R&D institutions network, there would be 14 R&D institutions, 6 central organizations, and INTIB, the work load of each of these organizations is worked out in Figure 3.

Finance

It is clear that activities under each of these networks cannot be carried out without contributions from the members of the networks. In view of the advantages that will be derived by the members of the network, it is suggested that each institution bear its own costs incurred in carrying out the activities of the networks. This means, a country which joins the network has to meet all the expenditure incurred within the country for promoting the activities of the network. It follows that salaries of the personnel engaged

Finance - continued

In this work, the cost of arranging for collection, storage, and dissemination of information, maintenance of correspondence and contacts with the members of the network, and establishment of infrastructure for this purpose has to be met by the country and the concerned R&D institutions. The costs that are incurred outside each country have to be met by INTIB. This means that INTIB will have to meet its in-house expenditure and promotional expenditure for increasing inter-institutional and inter-country contacts and exchange of experience.

Activities of INTIB

INTIB will play a nodal role in the establishment of networks and the promotion of its activities to increase flow of information on R&D results. For this purpose, INTIB could also consider other activities to achieve objectives of the networks. Among these activities are the following:

1. Organizing of Get-Togethers:

   It is necessary for strengthening the network activities that people who are involved in networks are brought face to face and given opportunities to exchange experience. It is, therefore, suggested that opportunities may be provided one in two years to network members to meet in different countries and organizations to exchange information and experience and work out improvements in the operation of the networks.

Activities of INTIB - continued

2. One of the important things INTIB could do to see that the network activities are proceeding as intended is to monitor these activities with a view to find out what is happening and also to give assistance to network members for being more effective. It is suggested that INTIB engage an expert for visiting R&D institutions and chambers of commerce and industry associations who are members of the network, once a year, have discussions with them with regard to their experience, receive suggestions of members for improving operations of the networks and submit a report to the INTIB and the members for further needed action. About 3 man-months may be necessary for such a programme every year. Therefore, INTIB has to meet costs for an expert for 3 months in a year and also meet his travel and subsistence allowance.

3. R&D leaders and leaders of industries could be encouraged to visit sister-organizations in the network. Such visits could cover R&D institutions as well as industry associations and chambers of commerce. This will also greatly benefit the network activity.

Activities of INTIB - continued

4. Also, there is need for organization at the national level of get-togethers for promoting contacts between industry and R&D institutions. While this activity on promoting flow of information on R&D results to industry has to be carried out essentially at the country level, INTIB could provide assistance for organizing such get-togethers and engage services of an expert for short periods of time for the preparation and organization of such get-togethers.

5. For running a data base of R&D results of interest to industries in developing countries of the region INTIB has to collect R&D results made available by not only R&D institutions in developing countries of all regions but also organize collection of such information from similar R&D institutions in developed countries and also use data bases existing in developed countries. Data bases are being run by many UN organizations and others. There are also private data bases which could be connected on-line to INTIB data centre. Information available from such data bases could then be assessed and a newsletter prepared for sending it to members of the network and others interested.

The above suggested activities of INTIB will involve strengthening of the capabilities of INTIB both with regard to personnel as well as equipment. This should receive priority attention.

Activities of INTIB - continued

Figure 4 gives the combined network of R&D institutions, central organizations, chambers of commerce and industry associations, link and promotional organizations, and INTIB. It also gives inputs and outputs in INTIB. While working of the networks will involve goodwill and hard work, a close analysis of networks indicates that the work load on each of the members in the network is relatively small. This is as it should be in a network, minimum input from each member and maximum benefits for all. The activities of INTIB will increase considerably. If each one of the members of the network can carry out the responsibilities entrusted to them with their own resources, the network has every chance of succeeding in accomplishing its objectives.

Issues

The foregoing will raise the following issues:

1. Is there a need for promoting increased flow of information on R&D results among R&D institutions in developing countries and between them and potential users viz., small and medium scale industries?

   In the light of the national development objectives and the availability of R&D infrastructure and existance of small and medium scale industries in each one of the developing countries in the ESCAP region, one hasto consider the need for promoting increased flow of information on R&D results among developing countries. The potential of such flows in reducing individual

Issues - continued

1. - continued

efforts in R&D institutions and at the same time giving maximum returns on investment in the infrastructure facilities and manpower need to be considered. In this connection, the requirements of small and medium scale industries who need assistance from R&D institutions for establishing new lines of activity, modernizing existing operation and systems, testing and evaluation of their products, standardization, documentation services, training, etc., have to be taken note of. There is increasing realization among the developing countries that such flows are needed and should be further increased.

2. Is the network system suitable for this purpose? Annexure 1 gives a concept for a network system which has many advantages if properly worked by members of the network. The whole idea is that each institution could contribute whatever it could and all the members in the network will get the maximum benefits. While it is appreciated that some networks established earlier had not delivered goods to the extent expected, still there is no doubt that network activity has great potential to developing countries. There are many examples of networks which have successfully worked on individual technologies, exchanging information, etc. Network activity is promoted in developed countries also. In the light of

Issues - continued

2. - continued

the experience already available, the workshop may like to discuss the need for a network for increasing information flows on R&D results among the R&D institutions and between them and small and medium scale industries.

3. What has been the experience of networks already established - under UN auspices and others?

The question is posed to elicit comments regarding actual experience of members participating in the workshop may have had in their own spheres of operation. While some networks have been able to achieve results others have not been able to do so. In some cases, there has been limited success. Knowledge about difficulties encountered in operation of such networks would greatly help in designing network activities in the future. Participants may like to discuss their experience in the operation of networks.

Issues - continued

4. How can difficulties experienced earlier be overcome?

Under this head are to be discussed matters regarding institutional, financial, legal, and other difficulties encountered in operating networks. The modalities of organizing network activities by overcoming the difficulties experienced earlier and making adequate arrangements for financing such activities are to be covered.

5. What should be the salient features of agreements between INTIB and national governments and R&D institutions?

INTIB and UNIDO have been functioning for a number of years as a source of industrial information to developing countries. It is expected that with proper organizational arrangements in the INTIB, it could play a very important role in promoting information flows on R&D results among R&D institutions and between them and the users. The workshop may like to consider the suggestions given in the paper with regard to the organization of INTIB activities in the networks and R&D institutions and small and medium scale industries and suggest broad features of agreements that need to be concluded between INTIB and individual governments and R&D institutions in those countries. Without proper arrangements in this regard it is hard to see how the networks could deliver the outputs expected of them. The participants may like to discuss the arrangements suggested in the paper with a view to improve them.

Issues - continued

6. What type of information can be shared?

Members of the network countries have to decide upon the types of information they could exchange among themselves. One of the proposals that could be discussed is that confidential technological information could be exchanged only on an individual basis and under terms to be negotiated between the parties involved in such exchanges. What needs to be and can be exchanged freely would be R&D information of general nature indicating the specific projects, types of work, and results. It is to be appreciated that R&D results alone are not technology and many inputs besides technology are required for establishing industry successfully. In the light of the above and the experience available to the R&D institutions in member countries the workshop could arrive at the criteria regarding the type of information that could be shared among the members of the network.

Issues - continued

7. What type of information has to be collected by institutions in developing countries and existing data bases in those countries and how?

For making the working of the network of R&D institutions effective, the selected R&D institutions will have to make efforts to collect information available within the country from other R&D institutions. This information has to be evaluated and stored in a data base which can be accessed by INTIB and other members of the network. Countries having a large number of R&D institutions, have a need for a country data base which can be linked to INTIB via the network. What types of information should be included in the data base and how this is to be done are questions that could be discussed and guidelines evolved by the workshop.

8. How to increase information flow on R&D results to potential users?

There are many modes of exchanging information among R&D institutions and between them and the users. Among these modes are letters, visits, seminars, get-togethers, secondment of staff, etc. activities which are suggested in this paper. The network includes all of these. The workshop could discuss these various modes and agree on the methodologies for facilitating information flow through the networks.

Issues - continued

9. What is the potential of joint projects in order to strengthen linkages between R&D institutions in developing countries?

While every joint project may not involve all the members of the network, such projects will strengthen linkages among R&D institutions in developing countries. Those projects will also generate R&D results of interest to other R&D institutions not involved in the joint projects and small and medium scale industry in all the developing countries. Therefore, the concept of joint projects needs to be given great importance. The workshop may like to deliberate upon such activities and give considered view with regard to the need for implementing such projects.

10. Should not the networks be started with selected institutions, others joining later on?

In the initial stages, it may not be possible for all R&D institutions in each country to be directly evolved in the network. When there are a large number of institutions in the country, they have to be brought into a network in the country itself such that a focal agency in that country could be a partner in the network proposed in the paper. Also, some R&D institutions may like to

Issues - continued

10. - continued

Join the network at a later date. Provision must be made for such institutions to join the network. The workshop may like to identify at least one institution, either individual R&D institution or a central organization, from each of the developing countries in the ESCAP region such that they could be members of the network to start with.

11. How to meet costs? Can the following modalities work:

- Country's internal costs by countries
- Outside costs by INTIB.

How to finance the whole activity is an important matter for consideration. The proposals detailed in this paper are likely to impose minimum strain on individual countries, and R&D institutions working under this network are essentially an extension of their existing activities. It ultimately boils down to nominating a person at a fairly senior level to keep the network activities going on all the time. His job will be to promote contacts and increase the flow of information among the network members. He should be in constant touch with the members of the networks and the INTIB. It is suggested in the paper that six man-months may be needed for this activity. Besides, countries may have to organize a methodology for collection and storage of information and screening it, if not already being done. If such

Issues - continued

activity is being done now, it will need to be oriented towards identifying R&D results of potential use to small and medium scale industries. Such work is naturally of great relevance to the country itself. It is also important to R&D institutions and small and medium scale industries in other developing countries. It is, therefore, suggested that in country expenditure needed for establishing such a data base and screening the results for purposes of the network proposed in the paper and preparation of needed documents for circulation among the network members and INTIB may be met by the country itself.

It is proposed in the paper that the in-house costs of INTIB and inter-country costs for operating the network may be met by INTIB. This would mean INTIB may have to bear the entire expenditure for establishing a data base on R&D results, collecting, screening, and storage of the results not only from R&D institutions in developing countries of all regions but also relevant results from R&D institutions in developed countries. INTIB has also to meet expenditure involved in preparation of periodical letters to be sent to members of the network, preparation and issue of newsletters and publications, organization of monitoring services, holding of periodical workshops for the members of the network, providing training to those needing it, promoting lecture series and visits by leaders of R&D institutions, maintenance of correspondence with industry associations, chambers of commerce and other activities connected with network. For this purpose, INTIB will require strengthening of its institutional capability and facilities. Table 8 gives an approximate idea of costs of institutions and INTIB in the networks.

Follow Up Activities

The follow up activities of this workshop will entirely depend upon its recommendations. Some specific activities are suggested below for consideration by the workshop. These activities have to be carried out at three levels, viz., country level, institutional level, and INTIB/UNIDO level.

1. Country Level:

   (A) Make a policy declaration for promoting network activity of information exchange on R&D activities.

   (B) Identify institutions and ask them to implement the policy, providing needed inputs; and

   (C) Enter into arrangements with UNIDO/INTIB for promoting network activities.

2. Institutional Level:

   (A) Work out network modalities with INTIB;

   (B) Nominate a senior official to carry out network activities;

Follow Up Activities - continued

2. Institutional Level: - continued

(C) Make known in the institution, the need to promote network activity; and

(D) Establish, when not existing, a group for evaluating R&D results before they are made available to users and members of the network.

3. UNIDO/INTIB Level:

(A) Conclude agreements with countries to enable implementation of network activities;

(B) Work out with R&D institutions, chambers of commerce and industry associations modalities for network operation;

(C) Organize monitoring activities;

Follow Up Activities - continued

3. UNIDO/INTIB Level: - continued

(D) Designate needed personnel to carry out network activities; and

(E) As needed, carry out modification in the in-house systems for gathering, evaluation, storage, retrieval, and dissemination of information on R&D results.

Conclusion

There is no doubt that information on R&D results is needed by small and medium scale industries in developing countries for starting new units, modernization of existing units and increasingly meeting national objectives of self-reliance. The sources of information available now are many. Tools exist for marshalling this information, quickly and efficiently and making it available to the user. A single institution in a developed country is not in a position to do this by itself. The developing countries do not have all the resources now for carrying out of needed R&D activities and providing information to small and medium scale industries. It is, therefore, imperative that all these organizations are connected into networks such that maximum advantages from the existing infrastructure could be derived with minimum cost. For this purpose, countries and R&D and other institutions have to play a very important role. INTIB has a very important catalytic function. It could take initiative in negotiating agreements with countries, working out details of the operation with individual members of the network and carrying out the nodal activities. With a relatively modest expenditure, the network activities could be carried out by the individual members. It is, therefore, suggested that the workshop may like to discuss issues posed earlier and come to conclusions and make recommendations which could be implemented by all concerned.

TABLE 1: SOME INDUSTRIAL R&D ORGANIZATIONS IN DEVELOPING COUNTRIES OF ESCAP REGION

Afghanistan, Bangladesh, Burma, China, India, Indonesia, Iran, Hongkong, Malaysia, Nepal, Pakistan, the Phillippines, Republic of Korea, Sri Lanka, Singapore, Thailand, Vietnam - all have R&D institutions.

Some countries have central organizations:

Bangladesh	.. BCSIR
China	.. SSTC
India	.. CSIR
Indonesia	.. LIPI
Pakistan	.. PCSIR
Phillippines	.. NSTA

Also, in many countries there are a number of in-house R&D organizations run by industry.

TABLE 2: INFORMATION NEEDS OF R&D INSTITUTIONS FOR SERVICING SMALL AND MEDIUM SCALE INDUSTRIES

Sl. No.	Information on Industry Needs	Action	By Whom
1.	Testing raw materials, products, and components.	a. Industry to approach R&D institutions.	a. Industry to take initiative to link up with R&D institutions.
		b. Strengthening facilities in R&D institutions.	b. Industry and government to provide funds.
2.	Development of methods for testing and quality control.	a. Industry to approach	
		b. Strengthening facilities in R&D institutions.	As in Sl. No. 1.
3.	Troubleshooting.	a. Industry to approach R&D institutions.	Industry and R&D institutions.
		b. R&D institutions to approach industry.	

continued...

TABLE 2: INFORMATION NEEDS OF R&D INSTITUTIONS FOR SERVICING SMALL AND MEDIUM SCALE INDUSTRIES - continued

Sl. No.	Information on Industry Needs	Action	By Whom
4.	R&D on: a. Materials b. Reduction in consumption of materials and energy. c. Improvements of methods of manufacture. d. Improvements in equipment. e. Import substitution. f. Use of by-products. g. Use of residues. h. New products. i. New processes.	Industries to approach R&D institutions; and R&D institutions to contact industries	a. R&D institutions and industry to establish links. b. Industry and government to provide funds or to strengthen them.
5.	Literature surveys	Industry to approach R&D institutions.	Industry and government to provide support for establishing facilities.
6.	Names and other details reg. technology suppliers, link organizations, etc.	-do-	-do-
7.	State of art information.	-do-	-do-

TABLE 3: INITIATIVES AT NATIONAL LEVEL

1. Enunciate a policy for the encouragement of TCDC and ICDC.

2. Give mandate to R&D institutions to establish linkages with similar institutions in developing countries of the region.

3. Give mandate to R&D institutions to establish active linkages with UN organization like UNIDO.

4. Promote establishment of link organizations for expediting flow of R&D results to users - design, engineering, and consultancy organizations, technology transfer institutions, industrial promotion organizations, and development banks.

5. Provide risk capital to technology transfer and link organization and other institutions charged with the responsibility of transferring R&D results to users.

6. Support UN intitiatives for promoting linkages between R&D institutions and industry and dissemination on R&D activities.

TABLE 3: INITIATIVES AT NATIONAL LEVEL - continued

7. Ask R&D institutions and link organizations to give in their annual report progress on their cooperation with R&D organizations in other developing countries and UN organizations.

8. Provide adequate finances to R&D institutions and link organizations for transferring R&D results to users.

9. Give incentives to users of R&D results from institutions within the country and in other developing countries - easy availability of foreign exchange, tax write-offs, none or nominal import duties on equipment, etc.

10. Make known to industry, policies for encouragement of the use of R&D results from local R&D institutions and those in other developing countries.

11. Assist establishment of data centres in chambers of commerce, industry associations, R&D institutions, and link organizations, using modern computerized facilities.

TABLE 3: INITIATIVES AT NATIONAL LEVEL - continued

12. Establish, as far as possible, computerized data bases for R&D results, lists of small and medium scale industries, R&D organizations, design, engineering, and consultancy services, promotional organizations, development banks, etc. Existing data bases have to be brought into the system and strengthened as needed by providing modern facilities like computers, reprographic equipment, etc.

13. Establish a monitoring mechanism at the national level to see that progress is being made, hurdles are removed and inputs are provided for promoting flow of R&D results to users within and outside the country.

TABLE 4: INITIATIVES IN R&D INSTITUTIONS

1. Pursue an active programme of establishing linkages with other R&D institutions, in and outside the country.

2. Establish strong linkages with users of R&D results - industry, chambers of commerce, industry associations, etc. Maintain contacts with link organizations, development banks, technology transfer organizations, industrial promotion organizations, and design, engineering, and consultancy organizations.

3. Establish strong linkages with UN organizations, e.g., INTIB/UNIDO.

4. Establish linkages with technology transfer organizations in and outside the country e.g., NRDC's.

5. Furnish regularly information to data bases like NTIS, Control Data, CDS/ISIS, MINISIS, INTIB, etc.

6. Designate an official whose duty is to nurture the linkages established, and look for other linkages to promote flow of R&D results.

TABLE 4: INITIATIVES IN R&D INSTITUTIONS - continued

7. Provide training facilities to those who need them, inside and outside the country.

8. Encourage visits among R&D institutions, in and outside the country.

9. Act as consultants to industry.

10. Frequent visits, meetings, and get-togethers with industry.

11. Participation in exhibitions - specially those organized by and for industry and industrial development.

12. Encourage staff to obtain retainerships from industry.

13. Promote joint R&D activities with sister institutions in other developing countries.

14. Maintain active lists of R&D institutions and potential users of R&D results for regular mailing of information.

TABLE 4: INITIATIVES IN R&D INSTITUTIONS - continued

15. Establish an in-house group for evaluating R&D results, before making them available to industry.

16. Use to the maximum extent media - press, radio, and TV in and outside the country to promote transfer of R&D results to users.

17. Establish liaison unit within the institution to interface with users of R&D results and outside organizations in and outside the country.

18. Produce pamphlets giving maximum information on R&D results, their use in industry, indicating capital outlays, equipment needed, etc., if need be with assistance from outside experts or organizations.

TABLE 5 : INFORMATION INPUTS INTO SMALL AND MEDIUM SCALE INDUSTRIES

Activities Required in Setting up and Operating a Small/ Medium Scale Industry	Information Inputs Required	Forms of Transfer	Institutional Arrangements	Government Action
Choice of Project	Profitability Financial requirements and availability Market—Internal and export Availability of other inputs—technology, raw materials utilities, equipment, land Availability of labour Incentives Environmental problems	Project Profiles Pre-investment reports Feasibility reports Consultations	Small Industry Service Institute (SISI) Chambers of Commerce Industry Associations Government Industry Department Engineering and consultancy organizations Consultants R&D institutions U.N. organisations	Promote consultancy centres, industry extension centres and technical information centres Provide financial and technical support for above agencies to prepare on request and on their own initiative profiles of potential projects
Seletion of Technology	Availability of technology suitable to local conditions Capacity of the plant Total cost Terms of transfer Compliance with goverment regulations	Patents Announcements in industrial and trade journals Publications —Manufacturers —R & D Institutions —Professional Specially commissioned reports Friends in industry exhibitions and trade shows	Technical information centres Small industry service institutes Technical consultancy centres Industry departments Technology transfer organizations Existing industry R&D institutions UN organizations	Establishment of technical information centres —National level —State level —District level Encourage organization of industrial trade fairs Provide incentives for promoting transfer
Infrastructure	Land, building, raw materials, utilities, manpower, finance, communication facilities, housing, waste disposal	Publications of industrial promotional agencies Government Industrial planning documents Specially commissioned reports	Government industry Department Industry promotion organization Training institutions	Co-ordination of activities of different departments involved Financial assistance for development of infrastructure Incentive system for establishing industry in backward areas and elsewhere
Purchase of Plant and Equipment	Availability Quality and specifications Cost Spares Training facilities Delivery schedules	Engineering handbooks National and international standards Pamphlets and manuals of manufacturers of goods and services Directories Industrial fairs Specially commissioned reports	SISI, National Small Industries Corporation (NSIC) Industry Associations Chambers of commerce Consultancy centres Exhibitions Existing industry Engineering and consultancy organizations R&D institutions*	Establishing standards institutions Establishing concerned testing facilities Promote trade and industrial exhibitions
Personnel and Training	Availability of qualified personnel Availability of training facilities for management and labour	Workshops Technical meetings Industrial and engineering courses Trade training	SISI, NSIC, Industrial Training Institutes (ITI's) National Productivity Council (NPC) Polytechnics, colleges and universities Employment exchanges R&D institutions*	Providing assistance for establishing training centres Establishing polytechnic colleges and universities Promote apprentice training schemes Encourage NGO's, professional bodies to conduct training programmes
Erection and Trial Run	Qualified and trained personnel Tools and tackle Raw materials and utilities	Equipment manuals Erections drawings Operation instructions List of tools, equipment testing facilities of raw materials Person to Person contacts	Consultancy centres Engineering contracting firms Technology/equipment supply firms R&D institutions*	
Operation and Maintenance	Trained personnel Raw materials, utilities and supplies Maintenance of spares and materials Tools and tackle Testing equipment	Engineering handbooks Material handbooks Trade directories —materials —equipment operation and maintenance manuals provided by equipment suppliers	SISI Sellers of equipment and supplies Selliers of technology and know-how R&D institutions*	Organising programmes on preventive maintenance and plant machinery through SISI, NPC, etc

*When institution provides technology

Activities Required in Setting up and Operating a Small/ Medium Scale Industry	Information Inputs Required	Forms of Transfer	Institutional Arrangements	Government Action
Marketing of Product	Markets Advertisement media Transport and communication facilities Salesmen Credit facilities	Trade journals Mass media- —Newspapers —Radio —Television Special publications Person to person contacts Producer-Buyer meetings	NSIC, SISI, Trade promotion councils Trade organizations Exhibitions and Trade fairs	Encourage and assist establishment of associations of small industries in different sectors Provide support for preferential buying and export
Expansion and Diversification	Market surveys Feasibility report Finance Other inputs	Trade journals Specially commissioned reports Person to person contacts Contacts with existing industry Contacts with R&D institutions	SISI consultancy centres Industrial Development Boards Industrial Finance Corporation Banks Industrial promotional organizations R&D institutions	To disseminate information on sectorwise growth Potential government plans, targets, policies etc
Finance	Availability Terms for borrowing, interest rate, period of repayment Insurance cover	Publications of Financial Institutions Contacts with Financial Institutions Contacts with industry	Industrial Development Banks Industrial Financial Corporations Commercial Banks Public subscription Venture capital organizations	Ensure prompt availability of funds for sound projects at reasonable interest rates Simplify procedures of securing loans Encourage funding agencies to take calculated risks
R & D	Choice of activity Availability of tools, equipment, apparatus, books and periodicals Qualified personnel Incentives R & D institutions in the public and private sectors	Professional publications Publications of R&D Institutions, professional societies Reports of technical meetings Publications of competitors Contacts with R&D Institutions Specially commissioned reports	Extension units of R&D institutions Co-operative research institutions [sector-wise] Universities and institutions of higher learning Autonomous R&D establishments	Evolve policies and incentives to encourage R&D work at plant level, at national research institutes Encourage national R&D institutes to have close linkage with industry to assist in improving their technical capabilities Establish technology transfer organizations
Technology Transfer	Terms of licensing Legal services	Announcements business/ trade journals through personal contacts Specially commissioned reports Patent information	National research and Development Corporation (NRDC) Consultancy centres SISI's Exhibitions Investment centres and patent attorneys	Provide incentives to promote technology transfer Establish technology transfer organizations Establish engineering consultancy firms
Stadardization	Availability of standards Testing facilities	National standards International standards Company standards	National standards institutions International standards organization Other standards organisation Suppliers publication Special reports R&D institutions	Establish national standards organization Encourage use of national standards providing incentives and compulsions Encourage wide dissemination of availability of standards, advantages of using standards Provide common testing facilities
Taxation and Incentives	Government rules and regulations	Government publications Publications of : —professional bodies —chambers of commerce —financial institutions —industrial development boards Special advice	Tax Lawyers and consultants Government and private agencies for distributing information on taxation	Provide clear guidelines Simiplify taxation matters Provide incentives to small industry for production of goods and their sale

Activities Required in Setting up and Operating a Small Medium Scale Industry	Information Inputs Required	Forms of Transfer	Institutional Arrangements	Government Action
Legal Matters, Contracts, etc.	Legal service	Licensing, handbooks, guides, legal documents Specially commissioned reports	Legal consultants Patent attorneys	
Sick Units	Management of enterprise Finance Market development Personal constraints	Specially commissioned reports	Consultancy organizations NPC, Institutes of Management, Banks Experts	Provide information on any special steps contemplated to revive sick units Provide guidelines for take-over and management of sick units
Environmental Problems	Government rules and regulations Availability of testing and monitoring equipment, disposal sites Technology for reuse of wastes and residues	Government publications Professional journals Publications of R&D institutions Specially commissioned reports Guidelines from regulatory agencies Contacts with industry	Ministries and departments of environment Consultancy centres Environment regulatory agencies Common testing facilities R&D institutions	Establish regulatory agencies Provide guidelines and standards Wide dissemination of information on policies, programmes, rules and regulations concerning environment Support and encourage R&D institutions to develop necessary technologies Provide incentives in special cases

TABLE 6: INITIATIVES AT THE INDUSTRY LEVEL

1. Establish active linkages with R&D institutions inside the country and other developing countries, indicate needs and encourage them to send information on R&D results.

2. Support R&D institutions by sponsoring R&D projects.

3. Use facilities available in R&D institutions for testing, standardization, quality control, and literature surveys. Also, give financial assistance to R&D institutions to strengthen such facilities.

4. Give facilities to R&D institutions for establishing pilot plant facilities, making prototypes, etc.

5. Collaborate with R&D institutions and technology transfer organizations in establishing pilot plants, demonstration units, and for making prototypes.

TABLE 6: INITIATIVES AT THE INDUSTRY LEVEL - continued

6. Make chambers of commerce and industry associations establish active linkages with R&D institutions and technology transfer and other link organizations in and outside the country and UN organization like UNIDO for obtaining information on R&D activities in developing countries.

7. Encourage chambers of commerce and industry associations to establish data bases on R&D results available in developing countries.

8. Have scientists, technologists, and engineers as consultants on a retainership basis.

9. Encourage visits by personnel from R&D institutions to industrial units and in turn personnel from industry visit R&D institutions.

10. Promote participation of R&D institutions in trade fairs and exhibitions, if need be by providing free space and other facilities.

TABLE 7: INITIATIVES IN UNIDO/INTIB

1 Further strengthen linkages with R&D institutions in developing countries of ESCAP region.

2. Further strengthen linkages with chambers of commerce, industry associations, T. T. institutions, design, engineer in and consultancy organizations in developing countries of ESCAP region.

3. Establish and run the following services:

a) R&D news dissemination concentrating on activities of R&D institutions in developing countries;

b) A data centre for storing information on R&D activities in developing countries;

c) Lecture service to bring to notice of potential users results of R&D in developing countries.

TABLE 7: INITIATIVES IN UNIDO/INTIB - continued

3. - continued

d) Lectures by R&D leaders in developing countries in selected developing countries of the region;

e) Lectures by business leaders on requirements of industry.

f) Organization of get-togethers between R&D institutions and industry - national and regional; and

g) Demonstration projects for promoting technologies.

4. Establish and run a monitoring mechanism to promote flow of information on R&D results to users.

5. Make greater use of media - press, radio, TV, films, etc., - to bring R&D results to the notice of users.

TABLE 8: ESTIMATE OF LIKELY INPUTS FROM R&D INSTITUTIONS, INDUSTRY, AND INTIB/UNIDO

Per Annum

A. R&D Institutions

- 6 man-months of a senior official.

B. For Central Agencies in the Country Where They Exist

- 6 man-months of a senior official.

Note: The above are in addition to organization of information in the country and evaluation of R&D results

C. UNIDO/INTIB

- Assistance to 14 R&D institutions and 6 central agencies.

1.	Assistance - US $2000 per year per unit	$40,000
2.	Monitoring - 3 man-months plus travel in the region	30,000
	Total	$70,000

This amount is in addition to what is required in INTIB to run the services suggested in the paper.

TABLE 8: ESTIMATE OF LIKELY INPUTS FROM R&D INSTITUTIONS, INDUSTRY, AND INTIB/UNIDO - cont.

Per Annum

D. Trade Associations and Chambers of Commerce

These bodies are expected to do work under the networks as part of their normal activity. No external assistance is suggested.

However, this work also is to be monitored along with that of R&D institutions.

E. Link and Promotional Organizations

As part of their normal activity, these organizations are expected to do work needed to assist INTIB in promoting network activities. No external assistance is suggested.

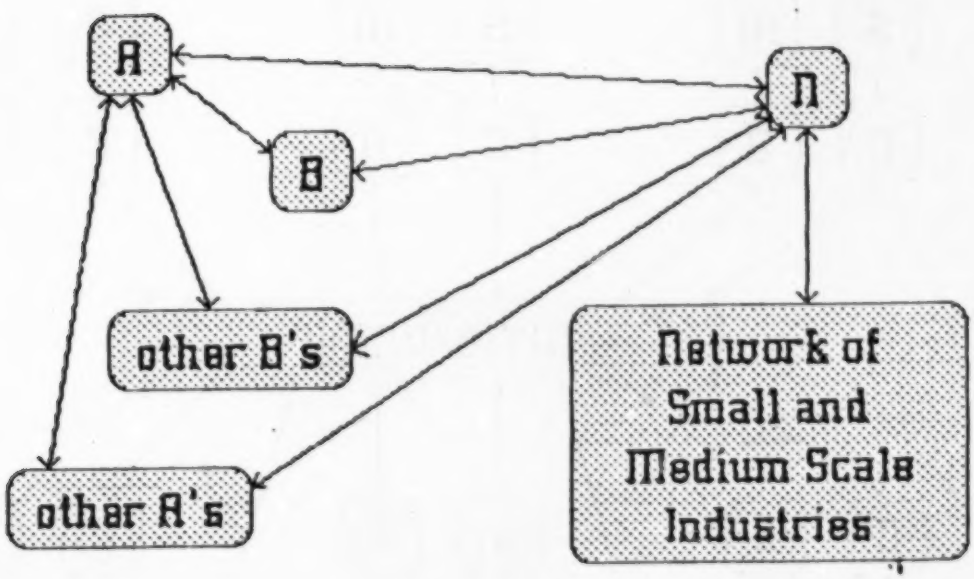
Fig. 1 - Network of R & D Institutions

Involving,

A = Individual R & D Institutions

B = Central Organisations

Π = INTIB/UNIDO



Linkages:

1. Individual R & D Institutions and Individual R & D Institutions
2. Individual R & D Institutions and Central Organisations
3. Individual R & D Institutions and INTIB
4. Central Organisations and Central Organisations
5. Central Organisations and INTIB

Fig. 2 - Network of Small and Medium Scale Industries

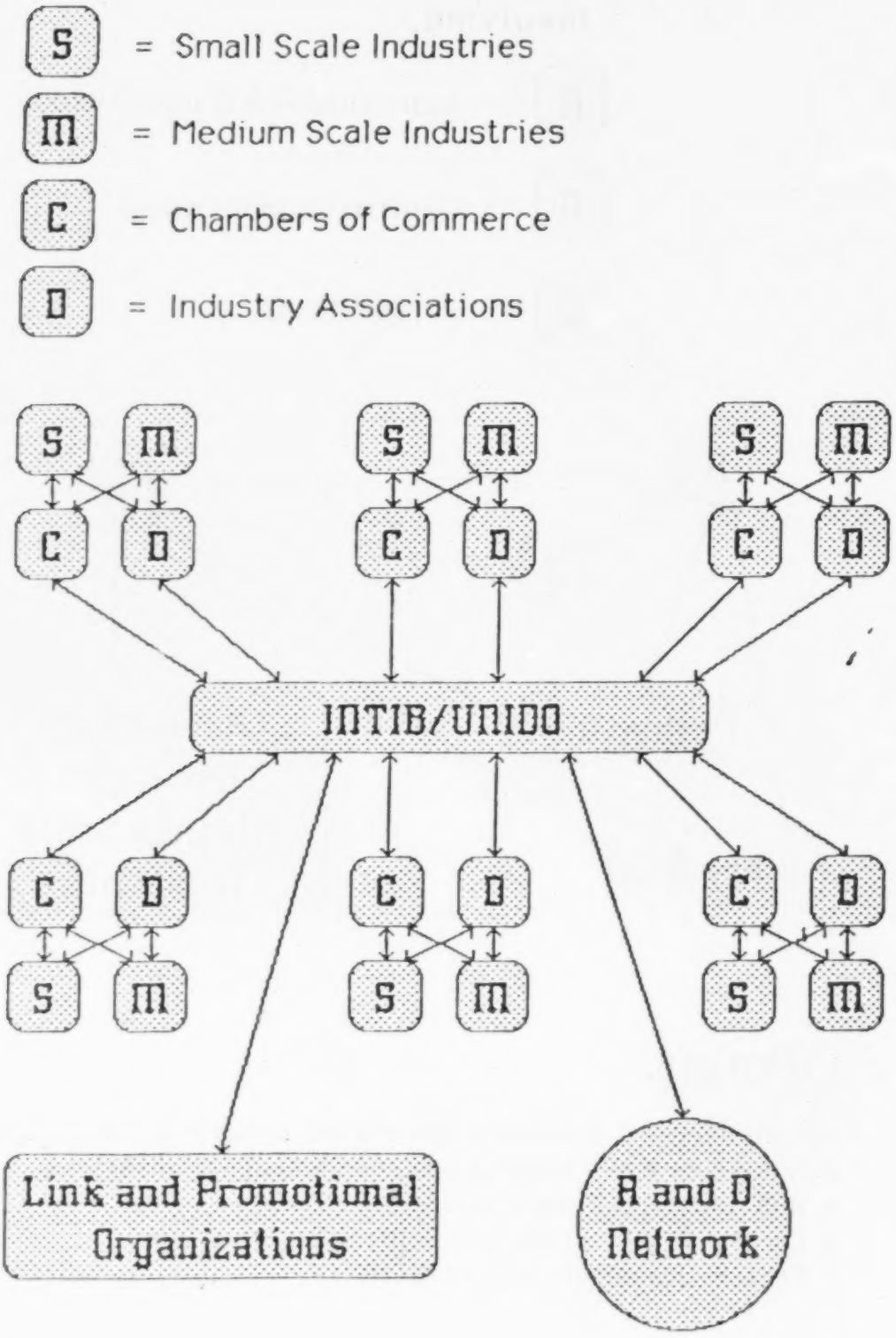
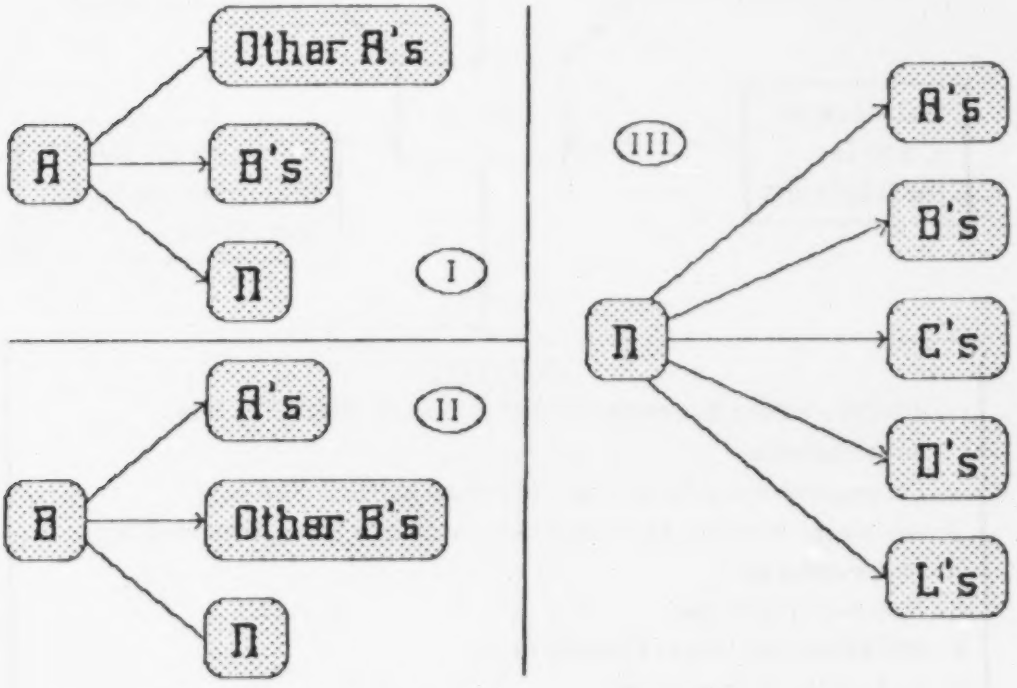

S = Small Scale Industries
M = Medium Scale Industries
C = Chambers of Commerce
D = Industry Associations
INTIB/UNIDO
Link and Promotional Organizations
R and D Network

Fig. 3 - Estimated Work Loads in the Networks and INTIB

Assumptions

1. Period ---------- One Month
2. R and D Organisations ---------- (A) 14
3. Central Organisations ---------- (B) 6
4. Nodal Organisation ---------- (N) 1
5. Chambers of Commerce ---------- (C) 25
6. Industry Associations ---------- (D) 25
7. Link and Promotional Organisations (L) 15



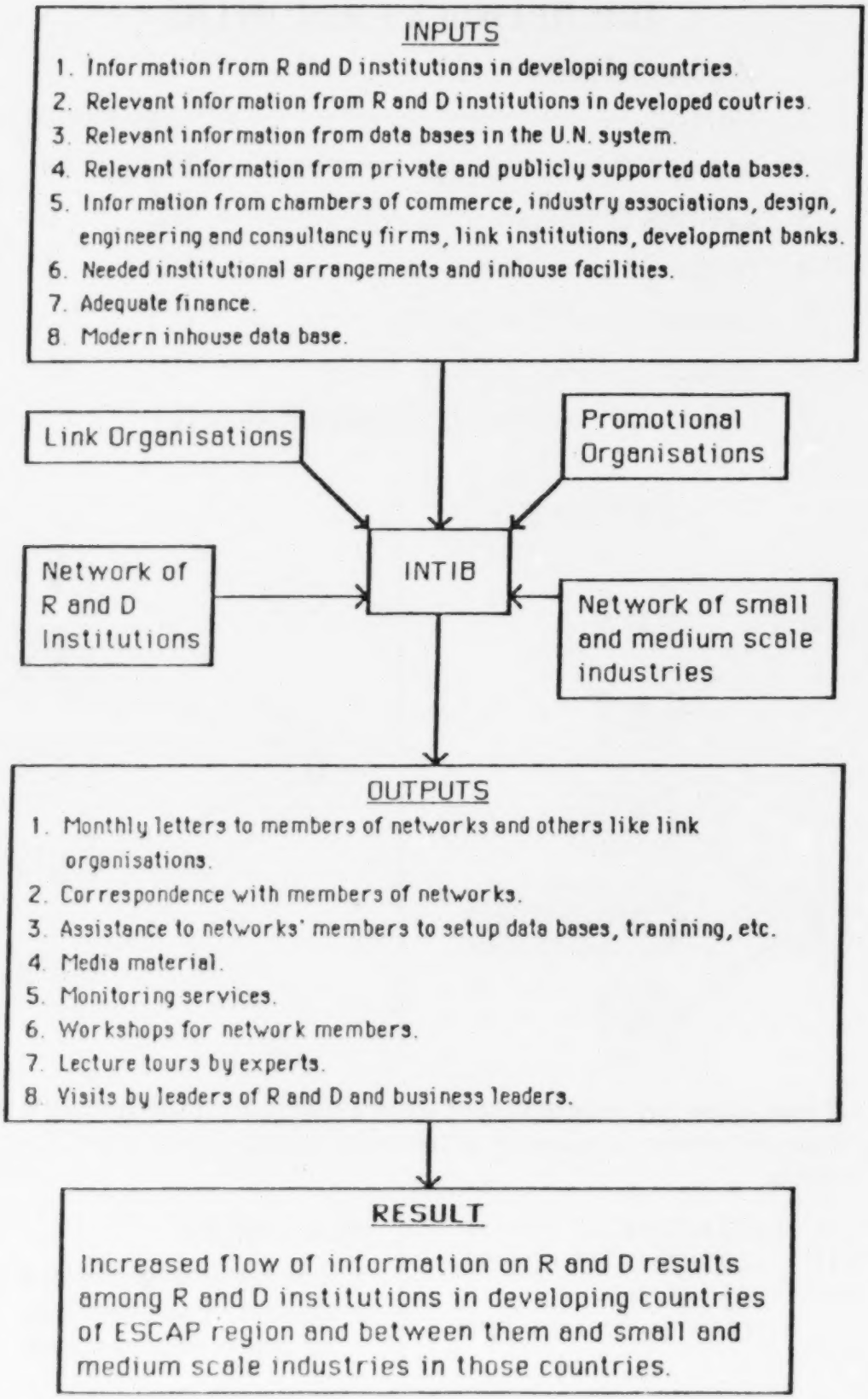
If one letter per month is sent from a member in the Network to other members, number of letters each member has to send per month:

I -- 20 letters (13 + 6 + 1)
II -- 20 letters (14 + 5 + 1)
III -- 85 letters
(14 + 6 + 25 + 25 + 15)

For C's and D's:

1. One letter a month to N
2. One letter to every one of concerned members

Fig. 4 - Activities of INTIB in the Networks


INPUTS
1. Information from R and D institutions in developing countries.
2. Relevant information from R and D institutions in developed coutries.
3. Relevant information from data bases in the U.N. system.
4. Relevant information from private and publicly supported data bases.
5. Information from chambers of commerce, industry associations, design, engineering and consultancy firms, link institutions, development banks.
6. Needed institutional arrangements and inhouse facilities.
7. Adequate finance.
8. Modern inhouse data base.
Link Organisations
Promotional Organisations
Network of R and D Institutions
INTIB
Network of small and medium scale industries
OUTPUTS
1. Monthly letters to members of networks and others like link organisations.
2. Correspondence with members of networks.
3. Assistance to networks' members to setup data bases, tranining, etc.
4. Media material.
5. Monitoring services.
6. Workshops for network members.
7. Lecture tours by experts.
8. Visits by leaders of R and D and business leaders.
RESULT
Increased flow of information on R and D results among R and D institutions in developing countries of ESCAP region and between them and small and medium scale industries in those countries.

//ANNEXURE-1//

The Network-Concept for Institutions in Developing Countries of ESCAP Region

A network is a pattern of threads or lines, each separate from the others yet crossing the others and joined to them at the crossing points. A network is formed either from the need to have several threads, which have to be joined at the crossing points, as in the case of a fishnet, so that they may together form the net, or from the need to connect predetermined points, as in the case of a railway network. Whichever the need, the strength of a network depends both on the lines that connect and on the strength of the points.

The network approach is eminently suited for application in regional cooperation for strengthening the capacities of developing countries for technology transfer and development. Conditions in developing countries, relevant to such cooperation, may be summarized as follows:

(a) Needs are many but resources are limited;

(b) In almost all countries (i.e., with the exception of very small or newly-independent countries) there exist institutions or programmes concerned with the development and transfer of technology; some of these have qualified and trained personnel and modes endowments of

//ANNEXURE-1//

The Network-Concept for Institutions in Developing Countries of ESCAP Region - continued

(b) - continued

equipment. They have informal communications with similar institutions in other countries but the links are somewhat tenuous and, in any case, their personnel seldom get together or visit other institutions;

(c) R&D projects in the same field are often undertaken without one institution being aware of what another is doing, or, what is worse, of what has already been done. There is thus a waste of resources;

(d) The UN and bilateral systems of technical assistance are unable to cope with the demand for more assistance in the form of assignment of experts or expert teams owing to the shrinking of aid programmes both in money and real terms. Moreover, when such programmes of assistance terminates, it is seldom that the institution that received the assistance is able to continue on its own;

//ANNEXURE-1//

The Network-Concept for Institutions in Developing Countries of ESCAP Region - continued

(e) There are many highly technically qualified person in developing countries who seek employment elsewhere, owing to lack of employment opportunities, incentives, facilities, and many other reasons. The more qualified and capable the person, the more the chances of his or her finding employment in a developed country;

(f) All the above factors hamper the building up of self-reliance in developing countries; more tragic is the breaking down of the confidence of qualified persons and of the people in general.

A network, if established and nurtured, will go a long way to alleviate the problems referred to above. Evolving a network will not be without difficulties, but it has to be tried.

The network approach goes away from the concept of strengthening "centres of excellence", which, if successfully strengthened, will not ipso facto be of use to other developing countries. Moreover, most countries have a legitimate desire to develop own institutions and are justifiably reluctant to depend on an institutions in another country. The network approach by giving a role tc all institutions, and by not inhibiting the development of institutions, promotes cooperation while preserving the identity of the cooperating institutions.

//ANNEXURE-2//

Directories Available

1. Technological Research and Development Institutions in ASIA and the Pacific, - Vol. 1, 1982, ESCAP.

2. Experts of Developing ESCAP Countries, 1977, ESCAP.

3. Inter-Country Institutional Arrangements for Economic and Technical Cooperation among Devoloping Asia and Pacific Countries, Vol. 1, Inter-Governmental Institutions, 1981, ESCAP.

4. -do- Vol. II - Non-Governmental and National Institutions, ESCAP.

5. -do- Vol. III, Pacific Institutions, 1981, ESCAP.

6. Consultancy Services available in Developing ESCAP Countries, 1983, ESCAP.

7. Training Courses available in Developing ESCAP Countries, 1979, ESCAP.

//ANNEXURE-2//

Directories Available - continued

8. Guide to Training Opportunities for Industrial Developing - Eighth Issues, 1979, UNIDO.

9. Directory of Industrial Information Services and Systems in Developing Countries - prepared by INTIB-UNIDO, 1981.

10. Directory of Industrial Information Systems and Services prepared by Industrial Information International Centre for Industrial Studies, 1979, UNIDO.